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PATENT APPLICATION

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Date: December 2, 2010

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

GROUP ART UNIT: 3746

EXAMINER: Patrick Hamo

In re application of: Robb G. Anderson et al.	)	
Application No: 10/655,778	)	
Confirmation No.: 6594	)	For: CONTROL SYSTEM FOR PROGRESSING CAVITY PUMPS
Filed: 09/05/2003	)	
Attorney Docket No. 7193	)	
Customer No.: 22922	)	

Commissioner for Patents
Mail Stop Appeal Brief - Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

In support of the Appeal from the final rejection dated July 9, 2010, Appellants now submit their Appeal Brief pursuant to 37 C.F.R. §41.37.

INDEX

I. Real Party in Interest

The real party in interest in this application is Unico, Inc., the recorded assignee of the entire title of the subject application.

II. Related Appeals and Interferences

None.

III. Status of Claims

Rejected:	Claims 17-19, 21, 23, 24, 26, and 69-73
Allowed:	20, 25, and 74
Withdrawn:	None
Objected to:	None
Cancelled:	1-16, 22, 27-68, and 75-91
Appealed:	Claims 17-19, 21, 23, 24, 26, and 69-73

IV. Status of Amendments

There was no amendment after the Office Action dated January 19, 2010.

V. Summary of Claimed Subject Matter

A concise explanation of the subject matter defined in each of the independent claims will be described below, together with references to the specification of the application as filed by page and line number, and to the drawings by reference numerals. Each subsequent reference to a claim term typically includes the reference character for

ready reference. There is no intent to limit the claims in any manner by references, as this section is merely being included to comply with the Appeal rules.

Claim 17

A method of controlling a progressing cavity pump (page 11, line 25, paragraph 0039, FIG. 1, reference no. 32) for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled to an electric motor (page 12, lines 27-28, paragraph 0041, FIG. 1, reference no. 36) the method comprising the steps of:

determining in real-time values of torque and speed inputs to the progressing cavity pump without downhole sensors (page 7, lines 7-9, paragraph 0018; page 14, lines 9-10, paragraph 0045; page 15, lines 24-25, paragraph 0048) by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump (pages 14, line 19 to page 16, line 3, paragraphs 0046-0048);

using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump (page 7, lines 5-17, paragraph 0018; page 14, lines 6-19, paragraph 0045);

using the progressing cavity pump performance values to produce one or more command signals (page 12, lines 18-22, paragraph 0042, Fig. 3; page 16, line 5 to page 20, line 11, paragraphs 0049-0057); and

using the command signals to control in real-time closed-loop basis the speed of the progressing cavity pump (page 15, lines 5-12, paragraph 0046, Fig. 3; page 16, line 5 to page 20, line 11, paragraphs 0049-0057).

Claim 69

A pump control system (page 12, lines 9-13, paragraph 0040, FIG. 1, reference no. 20) for controlling a progressing cavity pump (page 11, line 25, paragraph 0039, FIG. 1, reference no. 32) for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled to an electric motor (page 12, lines 27-28, paragraph 0041, FIG. 1, reference no. 36), the pump control system comprising:

means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors (page 7, lines 7-9, paragraph 0018; page 14, lines 9-10, paragraph 0045; page 15, lines 24-25, paragraph 0048), by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump (pages 14, line 19 to page 16, line 3, paragraphs 0046-0048);

means for using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump (page 7, lines 5-17, paragraph 0018; page 14, lines 6-19, paragraph 0045); and

means for using the progressing cavity pump performance values to produce one or more command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump (page 12, lines 18-22, paragraph 0042, Fig. 3; page 15, lines 5-12, paragraph 0046, Fig. 3; page 16, line 5 to page 20, line 11, paragraphs 0049-0057).

VI. Grounds of Rejection to be Reviewed on Appeal

A. Claims 17-19, 21, 23, 24, 26, and 69-73 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Birckhead et al. reference (U.S. Patent Application Publication No. 2002/0074127, now U.S. Patent No. 6,536,522) in view of the Odachi et al. reference (U.S. Patent No. 6,869,272).

VII. Argument

A. Whether Claims 17-19, 21, 23, 24, 26, and 69-73 are patentable under 35 U.S.C. § 103(a) over the Birckhead et al. reference in view of the Odachi et al. reference.

Appellants note that the issues for the Board to decide in this appeal are whether Claims 17-19, 21, 23, 24, 26, and 69-73 are improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over the Birckhead et al. reference in view of the Odachi et al. reference. In deciding these issues, the Board needs to make that determination on the basis on the entire record, taking into account the relative persuasiveness of argument. As explained in *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) (citations omitted):

> "[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant.
>
> "After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument.

> "If examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent."

1. The cited references

The Birckhead et al. reference. The Birckhead et al. reference addresses the problems caused by inability of typical systems using a simple downwell pressure sensor to adjust speed of a pump. (emphasis added) See Background section. Birckhead et al. reference addresses this problem by adding various additional sensors and using the information sensed by these sensors to adjust pump speed. The Birckhead et al. reference teaches a pressure sensor in the wellbore adjacent the pump to measure the fluid pressure of fluid collecting in the wellbore, another pressure sensor disposed in the upper end of the wellbore to measure the pressure created by compressed gas above the fluid column, and a sensor disposed in the lower end of the tubing string to measure fluid pressure in the tubing string. A controller compares the signals from the sensors and makes adjustments based upon a relationship between the signals and preprogrammed information about the wellbore and the formation pressure therearound. See Summary of the Invention section. That includes downhole sensors for measuring the torque and speed of a motor operating a progressive cavity pump.

The Odachi et al. reference. The Odachi et al. reference teaches a method to overcome the problem of refrigerant condensing within a condenser after long periods of nonuse. See column 2, lines 1-14. The Odachi et al. reference teaches driving the motor (which drives the compressor) at a predetermined torque, regardless of speed, until the

movable scroll 32 of the motor 1 has moved a predefined distance. See column 5, lines 15-40. This portion of the motor driving is intended to clear the condensed refrigerant out from the condenser, which may strain the motor, if the motor was driven at a predetermined speed instead of a predetermined torque while the refrigerant is condensed within the condenser. Once the movable scroll 32 has progressed the preset distance, the motor ceases to be controlled in the constant torque mode and is then driven at a constant speed. See column 6, lines 34-36. Thus, while the motor of the Odachi et al. reference is driven at a constant torque, its controller is measuring the position of the moveable scroll, and then, at a predetermined position, the motor is driven at a constant speed. The Odachi et al. reference does not teach using real-times values of torque and speed inputs to calculate values representing performance and in turn controlling a motor with command signals based on the performance values.

The above discussion is to comply with the mandate of the U.S. Supreme Court in the Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966) case to determine the scope and content of the prior art. Graham further mandates that the differences between the claimed invention and the prior art must be ascertained, before it can be determined whether or not claims are obvious in view of the prior art. The Examiner has not done such analysis in the various rejections. The Examiner has merely identified elements of the present application in the several prior art references. For this reason alone, the rejection of the pending claims should be withdrawn.

2. Separate Argument for Claim 17

In the July 9, 2010, Office Action the Examiner rejected Claim 17 under 35 U.S.C. 103(a) as being unpatentable over the Birckhead et al. reference in view of the Odachi et al. reference.

The Examiner's rejection is legally and factually deficient, and should be overturned for no less than four independently sufficient reasons. 1. The Examiner has not made a finding of the level of ordinary skill in the art. 2. The Examiner has not engaged in the type of analysis required to make a *prima facie* case of obviousness. 3. The Birckhead et al. reference teaches away from combination with the Odachi et al. reference and from the solution of the present invention as claimed. And, 4. The combination of the Birckhead et al. reference and the Odachi et al. reference does not teach or suggest each and every element of the present Claim 17. For these reasons, the rejection of Claim 17 is erroneous and should be overturned.

a. Subject matter of the present claim

Claim 17 of the present application is in independent form and recites a "method for controlling a progressing cavity pump for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled through an electric motor." Claims 18, 19, 21, 23, and 25 depend from independent Claim 17.

Claim 17 provides, *inter alia*, determining values of torque and speed inputs to a progressing cavity pump coupled to an electric motor, by measuring electrical voltages

applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump. Claim 17 provides that this is accomplished without downhole sensors. (emphasis added)

Claim 17 further provides, using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump, and using the progressing cavity pump performance values to produce one or more command signals which are used to control the speed of the progressing cavity pump.

b. The Examiner has not made a finding of the level of ordinary skill in the art.

In the July 9, 2010, Office Action, the Examiner failed to follow the clear and explicit requirements of the Supreme Court in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966) and in KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 82 USPQ2d 1385 (2007). In order to present a *prima facie* valid rejection, these cases require initially resolving three questions of fact: 1. determining the scope and content of the prior art; 2. ascertaining the differences between the claimed invention and the prior art; and 3. establishing the level of ordinary skill in the pertinent art. Only then can it be determined whether or not claims are obvious in view of prior art.

An examination of the Office Action will reveal that there is nothing relating to the establishment of the level of ordinary skill in the pertinent art. The rejection thus

clearly fails to meet the explicit requirements of the Supreme Court. As such, the Office Action fails to make the findings required by KSR, and the 35 U.S.C. § 103 rejection is accordingly improper and should be reversed.

c. The 35 U.S.C. § 103(a) rejection does not comply with the requirements for a combination obviousness rejection.

The Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. The Supreme Court has weighed in on the issue of obviousness and noted that the analysis supporting a rejection under 35 U.S.C. § 103(a) should be made explicit, and that it was "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. The Court specifically stated:

> Often, it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an **apparent reason** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis **should be made explicit**.

KSR Int'l. Co. v. Teleflex, Inc. 550 U.S. 398, 418 (2007). (emphasis added.)

Therefore, in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to explicitly identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.

The July 9, 2010, Office Action justifies the combination of the Birckhead et al. reference with the Odachi et al. reference with regards to Claim 17 by stating "It would have been obvious to a person having ordinary skill in the art to have modified the control system of Birckhead with the system of Odachi that identifies situations in which motor parameters need to be adjusted to keep the fluid transfer device operating efficiently." Page 3, lines 9-13.

Even if, *arguendo*, this was a sufficient reasoning to modify the Birckhead et al. reference with the Odachi et al. reference to arrive at a device that adjusts "motor parameters," such reasoning would not support a combination of the references that renders the present Claim 17 unpatentable, as Claim 17 provides more than a method of adjusting motor parameters to keep a fluid transfer device operating efficiently. Such reasoning does not support the further modification of the references, while ignoring various features of the references, to arrive at the present invention as claimed. For example, a central feature of the Odachi et al. reference is setting the motor at a constant torque for a set position displacement, followed by setting the motor at a constant speed. The reasoning provided by the Office Action does not provide any rationale as to why

this feature of the Odachi et al. reference would be ignored, while other features would be incorporated into the Birckhead et al. reference.

Providing the rationale for making something different from the present invention as claimed is insufficient to support a finding of obviousness. The Examiner must provide rationale for arriving at the present invention as claimed. Because the rationale provided in the Office Action is insufficient, the Examiner has not provided a *prima facie* case of obviousness. Therefore, the rejection of Claim 17 and the claims dependent therefrom should be overturned.

d. The Birckhead et al. reference teaches away from combination with the Odachi et al. reference and from the solution of the present invention as claimed.

Claim 17 provides, *inter alia,* that one or more values representing the performance of the progressing cavity pump are calculated using the values of torque and speed inputs to the progressing cavity pump, as calculated from measurements of electrical voltages and currents applied to and drawn by the motor.

The Birckhead et al. reference does not teach or suggest this limitation, and in fact expressly teaches away from this limitation by disclosing that pump performance parameters are determined directly only through the use of a series of downhole pressure sensors 37, 50a and 50b. See the Birckhead et al. reference, column 4, line 28 to column 5, line 12. As stated in the present Application, the ability to determine

performance parameters of the progressing cavity pump, such as pressure, flow and fluid level without the use of downhole sensors is not taught or suggested by the Birckhead et al. reference and is a substantial advantage provided by the present invention.

The Birckhead et al. reference, as stated above, does not teach or suggest this element, and, in fact, expressly teaches away from this element by disclosing that pump performance parameters are determined directly solely through the use of the series of downhole pressure sensors 37, 50a and 50b.

In direct contrast to doing what might have been obvious, i.e. using the pressure sensors of the Birckhead et al. reference for directly measuring pressures generated by the progressing cavity pump, the present invention as claimed eliminates the need for such sensors or direct measurement through novel utilization of the voltage and amperage at the motor, for determining the performance of the progressing cavity pump. In the present invention, therefore, the functions performed by separate sensors in the Birckhead et al. reference are retained despite the elimination of the need for the sensors. See MPEP § 2144.04 II.B "omission of an element with retention of the element's function is an indicia of unobviousness."

The Birckhead et al. reference would not be combined with the portions of the Odachi et al. reference which teach estimating the position of a rotor to determine when to begin driving a motor at constant speed. Additionally, the Birckhead et al. reference teaches away from the present invention as claimed.

Appellants respectfully submit that the present Claim 17, and claims dependent therefrom, are allowable over the Birckhead et al. reference in view of the Odachi et al. reference. Therefore, Appellants respectfully request that the Board reverse the rejection of these claims.

e. The combination of the Birckhead et al. reference and the Odachi et al. reference does not disclose, teach, or suggest each and every element of Claim 17.

"Obviousness requires a suggestion of all limitations in a claim." CFMT, Inc. v. Yieldup Intern. Corp., 349 F.3d 1333, 1342 (Fed. Cir. 2003) (citing In re Royka, 490 F.2d 981, 985 (CCPA 1974)). For a combination of references to render a claimed invention obvious, the references must teach or suggest each and every limitation of the invention as claimed. The present Claim 17 includes elements that are not reasonably disclosed, taught, or suggested by the Birckhead et al. reference, alone or in any proper combination with the Odachi et al. reference. Appellants submit that the lack of these claim elements in the cited references is sufficient to require reversal of the rejection of Claim 17 and the claims dependent therefrom.

The July 9, 2010, Office Action stated "Birckhead does not disclose that the control method is accomplished without downhole sensors and in the manner claimed." Page 2, lines 18-20. The Office Action further stated that

> Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage and current

> supplied to a motor 1 and uses this information to determine the speed via speed control unit. The measured current also determines the torque via torque control unit 52 (also see Abstract) and determines the load required of the compressor so that the torque and speed inputs can be adjusted by command signals to more efficiently run the compressor in response to the performance value correspondence to load (col. 1, line 63-col. 2, line 27). The only inputs to determine the load on the compressor are the actual current and voltage. These inputs are used in a real-time basis to determine what the command speed and torque should be (constant speed or constant torque, low- or high- speed or torque) and are used in a closed loop system as seen in fig. 4.

Office Action, page 2, line 20 to page 3, line 7.

Claim 17 provides "using real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump," "using the progressing cavity pump performance values to produce one or more command signals," and "using the command signals to control in real-time closed-loop basis the speed of the progressing cavity pump."

The Odachi et al. reference does not disclose, teach, or suggest using real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump. Instead, the Odachi et al. reference specifically teaches driving the motor at a constant predetermined torque for a set distance, and then, regardless of when this distance is reached, driving the motor at a constant speed. See columns 5 and 6. This is completely different from the method of the present Claim 17.

The Odachi et al. reference does not disclose, teach, or suggest, using the progressing cavity pump performance values to produce one or more command signals,

the command signals being used to control the speed of the progressing cavity pump, as provided by the present Claim 17. The Odachi et al. reference is designed to remove condensed refrigerant from a condenser without asynchronously driving a motor. ("The present invention aims at providing a method of controlling an electric compressor such that the motor can be efficiently driven while preventing the motor from getting asynchronous." See Summary of the Invention.)

Thus, the Odachi et al. reference teaches driving the motor at a constant, set torque for a set distance, and then switching to driving the motor at a set speed. See columns 5 and 6. Performance of the motor is not taken into account in controlling the motor, as the variables are all set, i.e. nothing is adjusted based on performance, but instead a set torque is applied for a set distance, and then a set speed is applied.

The Odachi et al. reference does not disclose, teach, or suggest "using real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump," "using the progressing cavity pump performance values to produce one or more command signals," and "using the command signals to control in real-time closed-loop basis the speed of the progressing cavity pump," as provided by the present Claim 17. The combination of Birckhead et al. and Odachi et al. as asserted by the Examiner would not result in what is described and claimed in the present application as the Odachi et al. and Birckhead et al. references also do not teach these elements, as recognized by the Examiner, Claim 17, and the claims

dependent therefrom, are allowable over the Birckhead et al. reference in view of the Odachi et al. reference.

Therefore, Appellants respectfully request that the Board reverse the rejection of Claim 17, and Claims 18, 19, 21, 23, 24, and 26 dependent therefrom.

2. Separate Argument for Claim 69

In the July 9, 2010, Office Action the Examiner rejected Claim 69 under 35 U.S.C. 103(a) as being unpatentable over the Birckhead et al. reference in view of the Odachi et al. reference.

The Examiner's rejection is legally and factually deficient, and should be overturned for no less than four independently sufficient reasons. 1. The Examiner has not made a finding of the level of ordinary skill in the art. 2. The Examiner has not engaged in the type of analysis required to make a *prima facie* case of obviousness. 3. The Birckhead et al. reference teaches away from combination with the Odachi et al. reference and from the solution of the present invention as claimed. And, 4. The combination of the Birckhead et al. reference and the Odachi et al. reference does not teach or suggest each and every element of the present Claim 69. For these reasons, the rejection of Claim 69 is erroneous and should be overturned.

a. Subject matter of the present claim.

Claim 69 of the present application is in independent form and recites a "pump control system for controlling a progressing cavity pump for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled to an electric motor." Claims 18, 19, 21, 23, and 25 depend from independent Claim 17.

Claim 69 provides, *inter alia*, an apparatus including "means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without

downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump." Claim 69 further provides "means for using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump." Additionally, Claim 69 provides "means for using the progressing cavity pump performance values to produce one or more command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump."

b. The Examiner has not made a finding of the level of ordinary skill in the art.

In the July 9, 2010, Office Action, the Examiner failed to follow the clear and explicit requirements of the Supreme Court in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966) and in KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 82 USPQ2d 1385 (2007). In order to present a *prima facie* valid rejection, these cases require initially resolving three questions of fact: 1. determining the scope and content of the prior art; 2. ascertaining the differences between the claimed invention and the prior art; and 3. establishing the level of ordinary skill in the pertinent art. Only then can it be determined whether or not claims are obvious in view of prior art.

An examination of the Office Action will reveal that there is nothing relating to the establishment of the level of ordinary skill in the pertinent art. The rejection thus clearly fails to meet the explicit requirements of the Supreme Court. As such, the Office Action fails to make the findings required by KSR, and the 35 U.S.C. § 103 rejection is accordingly improper and should be reversed.

c. The 35 U.S.C. § 103(a) rejection does not comply with the requirements for a combination obviousness rejection.

The Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. The Supreme Court has weighed in on the issue of obviousness and noted that the analysis supporting a rejection under 35 U.S.C. § 103(a) should be made explicit, and that it was "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. The Court specifically stated:

> Often, it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an **apparent reason** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis **should be made explicit**.

KSR Int'l. Co. v. Teleflex, Inc. 550 U.S. 398, 418 (2007), emphasis added.

Therefore, in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to explicitly identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.

The July 9, 2010, Office Action justifies the combination of the Birckhead et al. reference with the Odachi et al. reference with regards to Claim 69 by stating "It would have been obvious to a person having ordinary skill in the art to have modified the control system of Birckhead with the system of Odachi that identifies situations in which motor parameters need to be adjusted to keep the fluid transfer device operating efficiently." Page 4, lines 8-11.

Even if, *arguendo*, this was a sufficient reasoning to modify the Birckhead et al. reference with the Odachi et al. reference to arrive at a device that adjusts "motor parameters," such reasoning would not support a combination of the references that renders the present Claim 69 unpatentable, as Claim 69 provides more than adjusting motor parameters to keep a fluid transfer device operating efficiently. Such reasoning does not support the further modification of the references, while ignoring various features of the references, to arrive at the present invention as claimed. For example, a central feature of the Odachi et al. reference is setting the motor at a constant torque for a set position displacement, followed by setting the motor at a constant speed. The reasoning provided by the Office Action does not provide any rationale as to why this

feature of the Odachi et al. reference would be ignored, while other features would be incorporated into the Birckhead et al. reference.

Providing the rationale for making something different from the present invention as claimed is insufficient to support a finding of obviousness. The Examiner must provide rationale for arriving at the present invention as claimed. Because the rationale provided in the Office Action is insufficient, the Examiner has not provided a *prima facie* case of obviousness. Therefore, the rejection of Claim 69 and the claims dependent therefrom should be overturned.

d. The Birckhead et al. reference teaches away from combination with the Odachi et al. reference and from the solution of the present invention as claimed.

Claim 69 provides, *inter alia*, "means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump."

The Birckhead et al. reference does not teach or suggest this element, and in fact expressly teaches away from this element by disclosing that pump performance parameters are determined directly only through the use of a series of downhole pressure

sensors 37, 50a and 50b. See the Birckhead et al. reference, column 4, line 28 to column 5, line 12. As stated in the present Application, the ability to determine performance parameters of the progressing cavity pump, such as pressure, flow and fluid level without the use of downhole sensors is not taught or suggested by the Birckhead et al. reference and is a substantial advantage provided by the present invention.

The Birckhead et al. reference, as stated above, does not teach or suggest this element, and, in fact, expressly teaches away from this element by disclosing that pump performance parameters are determined directly solely through the use of the series of downhole pressure sensors 37, 50a and 50b.

In direct contrast to doing what might have been obvious, i.e. using the pressure sensors of the Birckhead et al. reference for directly measuring pressures generated by the progressing cavity pump, the present invention as claimed eliminates the need for such sensors or direct measurement through novel utilization of the voltage and amperage at the motor, for determining the performance of the progressing cavity pump. In the present invention, therefore, the functions performed by separate sensors in the Birckhead et al. reference are retained despite the elimination of the need for the sensors. See MPEP § 2144.04 II.B "omission of an element with retention of the element's function is an indicia of unobviousness."

The Birckhead et al. reference would not be combined with the portions of the Odachi et al. reference which teach estimating the position of a rotor to determine when

to begin driving a motor at constant speed. Additionally, the Birckhead et al. reference teaches away from the present invention as claimed.

Appellants respectfully submit that the present Claim 69, and claims dependent therefrom, are allowable over the Birckhead et al. reference in view of the Odachi et al. reference. Therefore, Appellants respectfully request that the Board reverse the rejection of these claims.

e. The combination of the Birckhead et al. reference and the Odachi et al. reference does not disclose, teach, or suggest each and every element of Claim 69.

"Obviousness requires a suggestion of all limitations in a claim." CFMT, Inc. v. Yieldup Intern. Corp., 349 F.3d 1333, 1342 (Fed. Cir. 2003) (citing In re Royka, 490 F.2d 981, 985 (CCPA 1974)). For a combination of references to render a claimed invention obvious, the references must teach or suggest each and every limitation of the invention as claimed. The present Claim 69 includes elements that are not reasonably disclosed, taught, or suggested by the Birckhead et al. reference, alone or in any proper combination with the Odachi et al. reference. Appellants submit that the lack of these claim elements in the cited references is sufficient to require reversal of the rejection of Claim 69 and the claims dependent therefrom.

The July 9, 2010, Office Action stated "Birckhead does not disclose that the control method is accomplished without downhole sensors and in the manner claimed." Page 3, lines 16-18. The Office Action further stated that

> Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage and current supplied to a motor 1 and uses this information to determine the speed via speed control unit. The measured current also determines the torque via torque control unit 52 (also see Abstract) and determines the load required of the compressor so that the torque and speed inputs can be adjusted by command signals to more efficiently run the compressor in response to the performance value correspondence to load (col. 1, line 63-col. 2, line 27). The only inputs to determine the load on the compressor are the actual current and voltage. These inputs are used in a real-time basis to determine what the command speed and torque should be (constant speed or constant torque, low- or high- speed or torque) and are used in a closed loop system as seen in fig. 4.

Office Action, page 3, line 19 to page 4, line 8.

Claim 69 provides, *inter alia*, "means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump," "means for using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump," and "means for using the progressing cavity pump performance values to produce one or more command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump."

The Odachi et al. reference does not disclose, teach, or suggest means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump. Instead, the Odachi et al. reference specifically teaches driving the motor at a constant predetermined torque for a set distance, and then, regardless of when this distance is reached, driving the motor at a constant speed. See columns 5 and 6. This is completely different from the apparatus of the present Claim 69.

The Odachi et al. reference does not disclose, teach, or suggest, means for using the progressing cavity pump performance values to produce one or more command signals for controlling the speed of the progressing cavity pump, as provided by the present Claim 69. The Odachi et al. reference is designed to remove condensed refrigerant from a condenser without asynchronously driving a motor. ("The present invention aims at providing a method of controlling an electric compressor such that the motor can be efficiently driven while preventing the motor from getting asynchronous." See Summary of the Invention.)

Thus, the Odachi et al. reference teaches driving the motor at a constant, set torque for a set distance, and then switching to driving the motor at a set speed. See columns 5 and 6. Performance of the motor is not taken into account in controlling the motor, as the

variables are all set, i.e. nothing is adjusted based on performance, but instead a set torque is applied for a set distance, and then a set speed is applied.

The Odachi et al. reference does not disclose, teach, or suggest "means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump," "means for using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump," and "means for using the progressing cavity pump performance values to produce one or more command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump." as provided by the present Claim 69. The combination of Birckhead et al. and Odachi et al. as asserted by the Examiner would not result in what is described and claimed in the present application as the Odachi et al. and the Birckhead et al. references also do not teach these elements, as recognized by the Examiner, Claim 69, and the claims dependent therefrom, are allowable over the Birckhead et al. reference in view of the Odachi et al. reference.

Therefore, Appellants respectfully request that the Board reverse the rejection of Claim 69, and Claims 70-73 dependent therefrom.

VII. Conclusion

For the foregoing reasons, Appellants respectfully request that all the rejections advanced in the Office Action dated July 9, 2010 be reversed and withdrawn and that the Application move forward toward issuance.

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VIII. Claims Appendix

Claims 1-16 (Cancelled).

17. A method of controlling a progressing cavity pump for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled to an electric motor, the method comprising the steps of:

determining in real-time values of torque and speed inputs to the progressing cavity pump without downhole sensors by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump;

using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump;

using the progressing cavity pump performance values to produce one or more command signals; and

using the command signals to control in real-time closed-loop basis the speed of the progressing cavity pump.

18. The method of claim 17, wherein the step of using progressing cavity pump performance values to produce command signals comprises the steps of:

selecting a progressing cavity pump performance parameter to control;

determining a setpoint for the selected progressing cavity pump performance parameter;

calculating a control signal using the setpoint value of the selected progressing cavity pump performance parameter; and

calculating the command signals from the control signal.

19. The method of claim 18, wherein the selected progressing cavity pump performance parameter is the pump flow.

20. A method of controlling a progressing cavity pump for transferring fluid within a fluid system, the method comprising the steps of:

determining values of torque and speed inputs to the progressing cavity pump;

using the values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump;

using the progressing cavity pump performance values to produce one or more command signals; and

using the command signals to control the speed of the progressing cavity pump;

wherein the step of using progressing cavity pump performance values to produce command signals comprises the steps of:

selecting pump flow as the progressing cavity pump performance parameter to control;

determining a setpoint for the selected progressing cavity pump performance parameter;

calculating a control signal using the setpoint value of the selected progressing cavity pump performance parameter; and

calculating the command signals from the control signal; and

wherein the step of using the command signals to control the speed of the progressing cavity pump includes repetitively switching the speed of the progressing cavity pump between a set pump speed for a portion of a cycle period and zero speed for the remainder of the cycle period to achieve an average pump flow equal to the setpoint value of the pump flow.

21. The method of claim 18, wherein the selected progressing cavity pump performance parameter is the pump head pressure.

22. (Canceled).

23. The method of claim 17, wherein the step of using progressing cavity pump performance values to produce command signals comprises the steps of:

selecting a progressing cavity pump performance parameter to control;

determining a setpoint for the selected progressing cavity pump performance parameter;

calculating a control signal using the setpoint value of the selected progressing cavity pump performance parameter; and

calculating the command signals from the control signal.

24. The method of claim 23, wherein the selected progressing cavity pump performance parameter is the pump flow.

25. A method of controlling a progressing cavity pump for transferring fluid within a fluid system, the method comprising the steps of:

determining values of torque and speed inputs to the progressing cavity pump;

using the values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump;

using the progressing cavity pump performance values to produce one or more command signals; and

using the command signals to control the speed of the progressing cavity pump;

wherein the progressing cavity pump is coupled to an electric motor and the step of determining the torque and speed inputs to the progressing cavity pump includes the steps of measuring the electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of electrical voltages applied to the motor and

currents drawn by the motor to calculate at least one of the values selected from the group consisting of motor torque and motor speed;

wherein the step of using progressing cavity pump performance values to produce command signals includes the steps of selecting a progressing cavity pump performance parameter to control, determining a setpoint for the selected progressing cavity pump performance parameter, calculating a control signal using the setpoint value of the selected progressing cavity pump performance parameter; and calculating the command signals from the control signal;

wherein the selected progressing cavity pump performance parameter is the pump flow; and

wherein the step of using the command signals to control the speed of the progressing cavity pump includes repetitively switching the speed of the progressing cavity pump between a set pump speed for a portion of a cycle period and zero speed for the remainder of the cycle period to achieve an average pump flow equal to the setpoint value of the pump flow.

26. The method of claim 23, wherein the selected progressing cavity pump performance parameter is the pump head pressure.

Claims 27-68 (Cancelled).

69. A pump control system for controlling a progressing cavity pump for transferring fluid within a fluid system, wherein the progressing cavity pump is coupled to an electric motor, the pump control system comprising:

means for determining in real-time values of torque and speed inputs to the progressing cavity pump, without downhole sensors, by measuring electrical voltages applied to the motor and currents drawn by the motor, and using the measured values of

electrical voltages applied to the motor and currents drawn by the motor to calculate the values of torque and speed inputs to the progressing cavity pump;

means for using the real-time values of torque and speed inputs to calculate one or more values representing the performance of the progressing cavity pump; and

means for using the progressing cavity pump performance values to produce one or more command signals for controlling in a real-time closed-loop basis the speed of the progressing cavity pump.

70. The pump control system of claim 69, wherein said means using the progressing cavity pump performance values to produce command signals includes means for calculating a feedback signal indicative of the difference between a current value of a selected progressing cavity pump performance parameter and a setpoint value of the selected progressing cavity pump performance parameter, and means for calculating the command signals from the feedback signal.

71. The pump control system of claim 70, wherein the selected progressing cavity pump performance parameter is the pump flow.

72. The pump control system of claim 70, wherein the selected progressing cavity pump performance parameter is the pump head pressure.

73. The pump control system of claim 69, wherein said means using the progressing cavity pump performance values to produce command signals includes means for calculating a feedforward signal by predicting a value of mechanical input to the progressing cavity pump when operating with a selected progressing cavity pump performance value at a setpoint value, and means for calculating the command signals from the feedforward signal.

74. A pump control system for controlling a progressing cavity pump for transferring fluid within a fluid system, the pump control system comprising:

means for determining values of torque and speed inputs to the progressing cavity pump;

means for using the values of torque and speed inputs to calculate the pump flow as a selected value representing the performance of the progressing cavity pump;

means for using the progressing cavity pump performance values to produce one or more command signals for controlling the speed of the progressing cavity pump; and

means for repetitively switching the speed of the progressing cavity pump between a set pump speed for a portion of a cycle period and zero speed for the remainder of the cycle period to achieve an average pump flow equal to the setpoint value of the pump flow;

wherein said means for using the progressing cavity pump performance values to produce command signals includes means for calculating a feedback signal indicative of the difference between a current value of the selected progressing cavity pump performance parameter and a setpoint value of the selected progressing cavity pump performance parameter, and means for calculating the command signals from the feedback signal.

Claims 75-91 (Cancelled).

IX. Evidence Appendix

None.

X. Related Proceedings Appendix

None.